

# PATENT SPECIFICATION

DRAWINGS ATTACHED

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## COMPLETE SPECIFICATION

### Apparatus for the Manufacture of Reinforced Hose

We, DUNLOP RUBBER COMPANY LIMITED, a British Company of 1, Albany Street, London, N.W.1, and LARMUTH & BULMER LIMITED, a British Company of Unwin Street, Salford 6, Lancashire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a device for the manufacture of reinforced hose of the kind comprising a tube of elastomeric material such as rubber or plastic with a reinforcing cover of metallic wires wrapped helically around it in one or more layers.

It is known that soft wire made of copper or silver may be wrapped around a core to produce an electrical cable or the like. Electrical cable has been made by passing a core through the middle of rotating parts of an apparatus, the rotating parts carrying bobbins of copper or silver wire and guide means to lay the wire on to the core as it passes through. This type of apparatus has been successful because of the ease with which the soft metals normally used are capable of being deformed as they are wrapped around the core. Copper and silver wire however are not suitable for wrapping a core which comprises a tube of elastomeric material intended for use as a high pressure hose pipe because they are not strong enough and because of their expense. High tensile steel wire is preferred for such reinforcement but this has the disadvantage from the point of view of handling that it is very stiff and untractable.

The object of the present invention is to provide apparatus for wrap-reinforcing hose which will overcome this disadvantage.

According to the present invention apparatus for the manufacture of hose having a reinforcing cover of stiff metallic wires wrapped helically around it comprises a carrier member having mounting means for a plurality of

wire-carrying bobbins, a straightening device for receiving and straightening the wires from each bobbin and an annular distributing device through the centre of which unwrapped hose may be passed and guide means for guiding and wrapping said wires from said distributing device on to said unwrapped hose, said carrier member, straightening device and distributing device being rotatable together about the hose whereby wires may be drawn from said bobbins and wrapped around said hose as the latter is drawn longitudinally and without rotation through the guide means so as to apply the wires to the hose in the form of a helically wound cover.

Preferably the straightening device comprises a plurality of rollers adapted to smooth out kinks and snarls in the wires as they are drawn therethrough. The annular distributing device comprises a circular plate having a plurality of holes formed on a pitch circle adjacent the outer periphery of the plate, each hole having a single wire passing therethrough. The guide means is positioned axially adjacent the circular plate and comprises a member closely encircling the tube and having a bell-shaped mouth to guide wires from the annular plate on to the hose as they are drawn through the guide in such a manner that each wire is laid closely adjacent its neighbour.

The helix angle is dependent on the number of wires used and their thickness. The axial speed of the hose and the rotational speed of the rotating parts must be matched to ensure that the wires are laid as desired.

The invention will now be described with reference to the accompanying drawings of which:—

Figure 1 shows an elevation of the hose reinforcing apparatus.

Figure 2 shows a perspective view of the apparatus cut away to show certain features.

Figure 3 shows a perspective view of the straightening device.

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Figure 4 is an end elevation of the yoke and guide member.

Figure 5 is a vertical section through the yoke and guide member as viewed from one side.

Referring to Figure 1 the hose reinforcing apparatus consists of a frame 1 on which is mounted a carrier member 2. The carrier member comprises a hollow cylindrical drum 3 having a plurality of spindles 4 extending radially outwardly from it. The spindles are disposed in eight longitudinal rows each of ten and the rows are spaced at equal angular intervals around it. Bobbins 5 having high tensile steel wire 6 wound thereon are mounted on the spindles 4 so that they can rotate thereon but are restrained from sliding off the spindles 4 when the drum 3 is in motion.

At one end of the drum 3 straightening devices 7 are mounted substantially in alignment with a tangent common to each row of bobbins 5. Each straightening device 7 comprises a bracket 8 (Figure 3) carrying three straightening and preforming rollers 9 arranged with their axes parallel to a tangent to the drum 3 on the respective longitudinal row and each roller 9 is profiled with ten grooves 10. Each of the grooves 10 is semi-circular in cross-section and of diameter at least equal to that of the wire 6 so that each groove 10 can receive a wire 6 from a bobbin 5. The rollers 9 are so arranged that the wire 6 in passing round each of them follows a meandering path in which it is bent through at least 90° in opposite directions with respect to its original path thus removing any kink or twist from it.

The drum is mounted on a hollow shaft 11 having an inside diameter greater than the outside diameter of the unwrapped hose, which is in the form of an elastomeric tube 12 and the shaft is rotatably mounted in bearings on pedestals 13 upstanding from the bed of the device. The drum is driven through gears from a motor 14 at the tube input end of the machine. The shaft 11 at the tube output end of the machine carries a circular collar 15 which has eight apertures 16 so that the eight groups of ten wires each can be led through their respective apertures. The collar 15 is mounted vertically and is supported on its outer periphery by the bearing pedestal 13.

A support for a distributing disc mounting flange 18 is provided by three equispaced axially aligned rods 17 which are welded to both the mounting flange 18 (Figure 5) and to the collar 15. The distributing disc 19 is secured by screws to the flange and is provided with eighty equispaced holes 19a drilled on a pitch circle adjacent the outer periphery of the disc 19.

To guide rails 20 (Figures 1 and 4) are provided which extend longitudinally on either side of the longitudinal centre line of the

apparatus. They terminate at one end adjacent the tube output end of the apparatus and at the other end at a point adjacent the distributing disc. A yoke 21 is adapted to be moved along the guide rails by means of a lead screw 22. Centrally on the yoke is positioned a guide member 23 which is clamped between two securing plates 24, 25. The guide member 23 comprises a hollow cylindrical portion through which the wrapped hose is adapted to pass with very little clearance. The cylindrical portion is provided at the end facing the distributing disc 19 with a flange 26 the entry to the hole through the guide member being faired at this end. The securing plates 24, 25 are formed each with a semi-circular groove and together they encircle the outer periphery of the cylindrical portion of the guide member 23. The grooves in the securing plates are disposed longitudinally of the apparatus. The side edges of the securing plates 24, 25 are slotted so that they will fall into and be held in a groove in the yoke 21. Forces acting on the guide member 23 press its flange 26 into abutment with the securing plates 24, 25 and the securing plates then transmit the force to the yoke 21. The upper securing plate 25 is held in position by a bridging plate 27 and locking assembly 29 which incorporates resilient means 30 to press the upper securing plate 25 on to the guide member 23.

At the tube output end of the machine a take-off device 28 is positioned in alignment with the shaft 11 and this draws the hose 31 through the machine as it is reinforced by the wire. Conveniently the take-off device 28 comprises (in the known manner) a pair of endless belts in line with the path of the hose 31 and arranged to receive and draw it between them.

The operation of the machine is as follows. The elastomeric tube 12 is fed through the bore of the shaft 11 until it is received by the take-off device 28. The wires 6 are fed through the guide member 23 and this is moved up to a certain distance from the distributing disc 19 by moving the yoke by means of the lead screw 22. When the machine is started the drum 3, collar 15 and distributing disc 19 commence to rotate and the tube is drawn through the guide member 23. Wires leaving the bobbins 5 are unsnarled at the straightening and preforming rollers 9 and pass through the collar 15 to the distributing disc 19 where they are positioned at equal intervals around the tube. From here they move radially inwardly and are wrapped around the tube. From here they move radially inwardly and are wrapped around the tube by their own movement and by means of the faired end of the guide member 23. The forward speed of the tube is matched with the angular speed of the drum 3, collar 15 and

distributing disc 19 so that the wires are wrapped on to the tube without any gaps between adjacent wires.

5 The distributing disc 19 may be changed for different types of hose and by passing the wrapped hose through a larger machine which is adapted to wind the wires in the opposite direction a second layer of reinforcing wires may be applied.

10 The problem of the untractibility of the wire has thus been overcome by preforming and unsnarling it with the straightening rollers and by providing the distributing disc and bell mouthed guide member to obtain a controlled deformation of the wire so that it lies as desired on the hose.

15 The foregoing description is related to one embodiment of the invention only, and in particular the selection of eighty bobbins positioned in eight rows of ten has been made for the convenience of the description and should not be construed to be a limitation on the scope of the invention. The size of the machine and the number of wires used is purely a matter of choice governed by the characteristics of the hose it is required to produce.

#### WHAT WE CLAIM IS:—

1. Apparatus for the manufacture of hose having a reinforcing cover of stiff metallic wires wrapped helically around it comprising a carrier member having mounting means for a plurality of wire-carrying bobbins, a straightening device for receiving and straightening the wires from each bobbin and an annular distributing device through the centre of which unwrapped hose may be passed and guide means for guiding and wrapping said wires from said distributing device on to said unwrapped hose, said carrier member, 35 straightening device and distributing device being rotatable together about the hose whereby wires may be drawn from said bobbins and wrapped around said hose as the latter is

drawn longitudinally and without rotation through the guide means so as to apply the wires to the hose in the form of a helically wound cover. 45

2. Apparatus according to claim 1 wherein said straightening device comprises a plurality of rollers which are adapted to bend said wires successively in at least two directions away from the original path of the wires from the bobbins. 50

3. Apparatus according to claims 1 or 2 wherein said annular distributing device comprises a circular plate mounted concentrically with said carrier member and having a plurality of circumferentially equal spaced holes formed on a pitch adjacent the outer periphery of said plate. 55 60

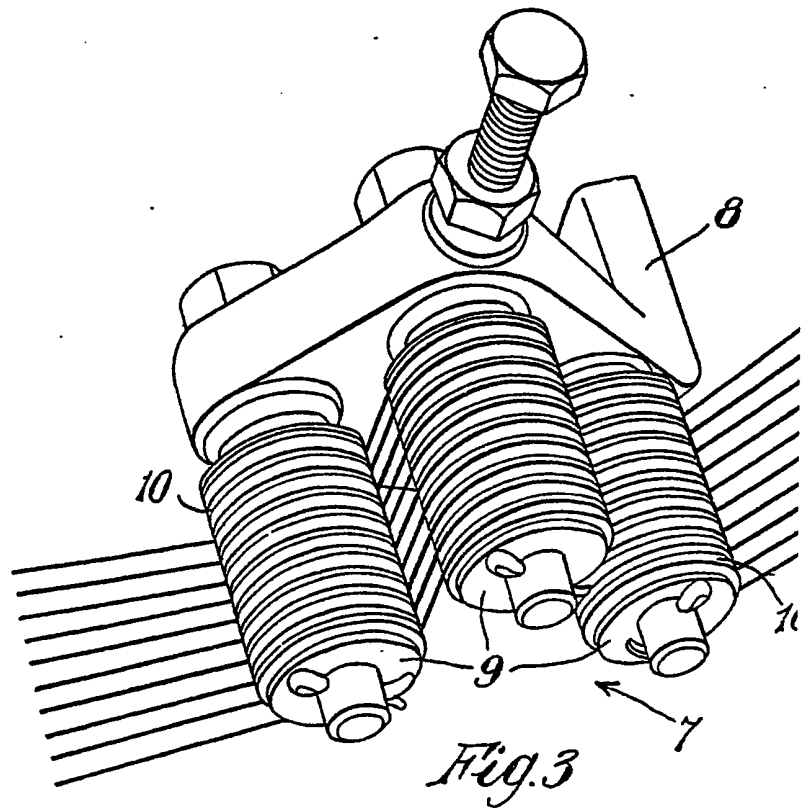
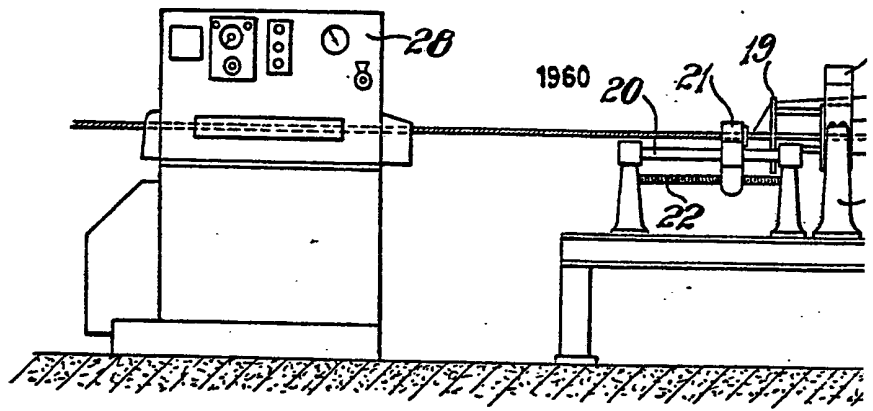
4. Apparatus according to any preceding claim wherein said guide means is positioned axially adjacent said annular distributing device and comprises a member closely encircling said hose and having a bell-shaped mouth to guide wires from said distributing device on to the unwrapped hose as the latter is drawn through the guide. 65

5. Apparatus according to any preceding claim wherein take-off means is provided to regulate the speed at which the hose is drawn through the apparatus so that the wires wrapped on to the hose lie in side by side relationship without any gaps therebetween. 70

6. Apparatus according to any one of claims 2 to 5 wherein said rollers comprise three in number and are formed with grooves on their outer periphery to receive and guide said wires. 75

7. Apparatus constructed and arranged substantially as described herein and illustrated in Figures 1—5 of the accompanying drawings. 80

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2 SHEETS

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Sheet 1

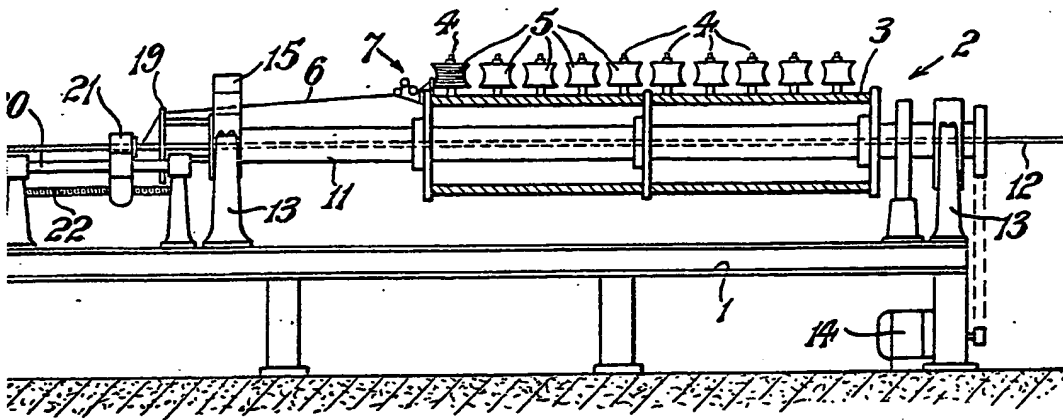


Fig. 1

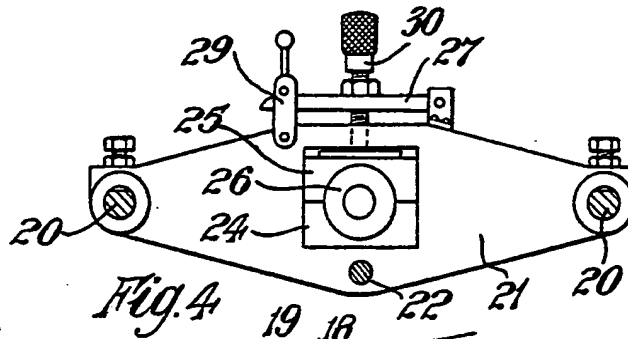
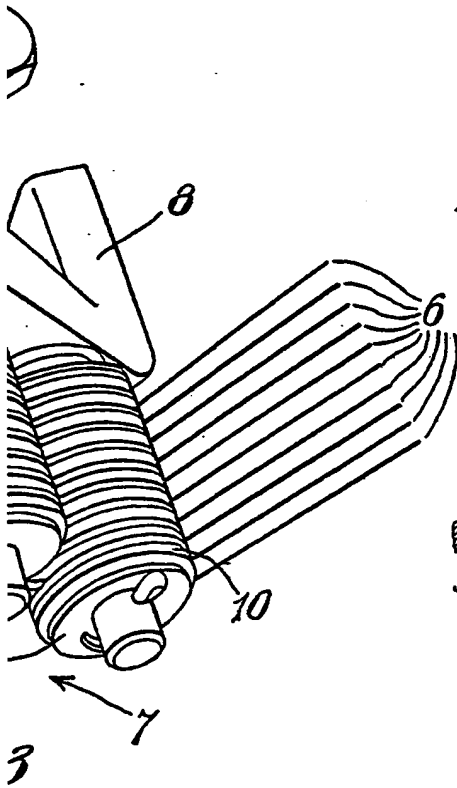


Fig. 4

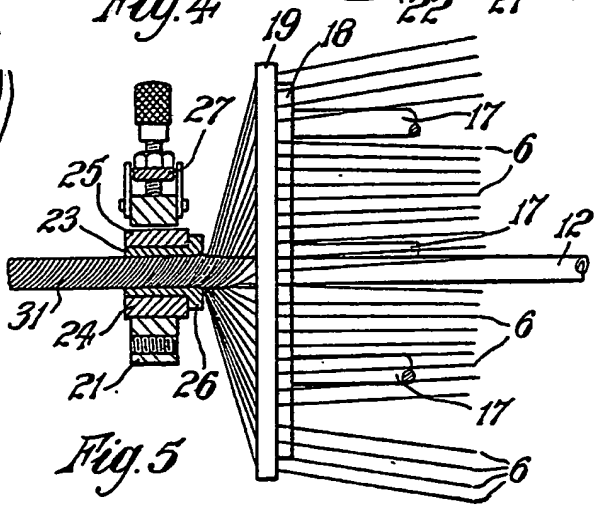


Fig. 5

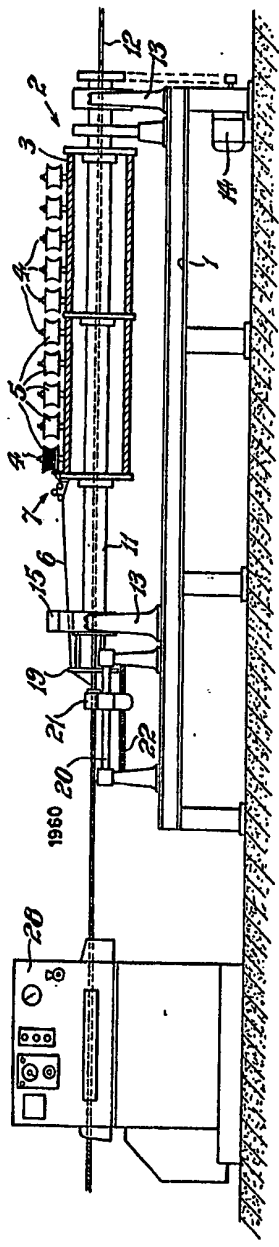


Fig. 1

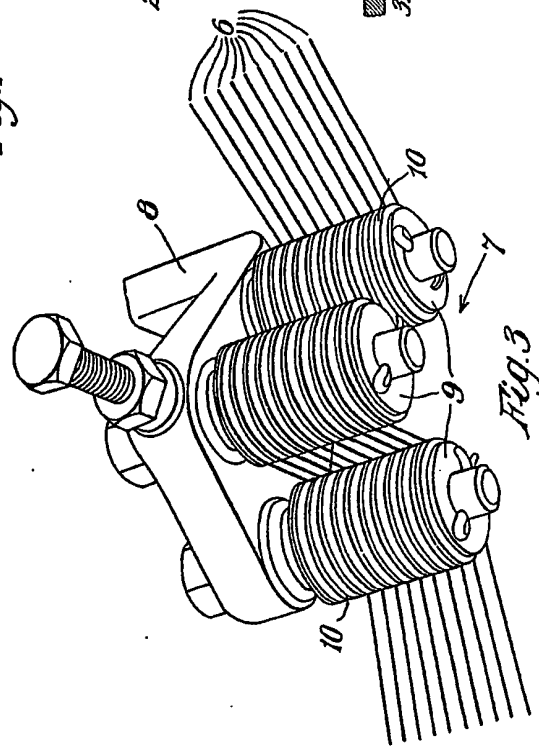


Fig. 3

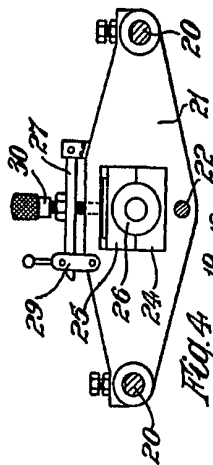


Fig. 4

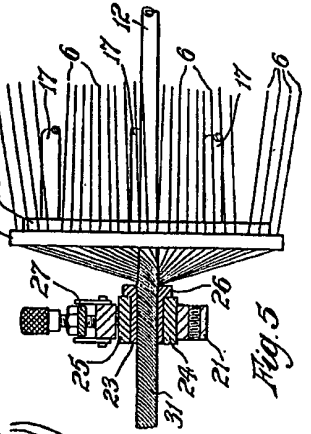
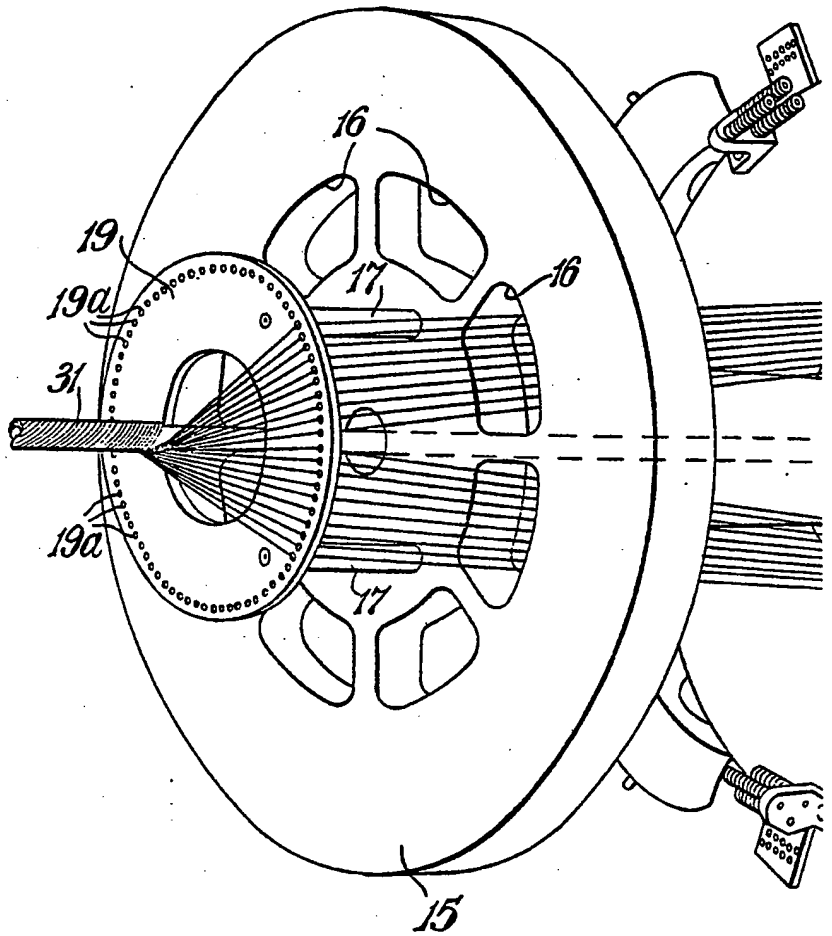


Fig. 5



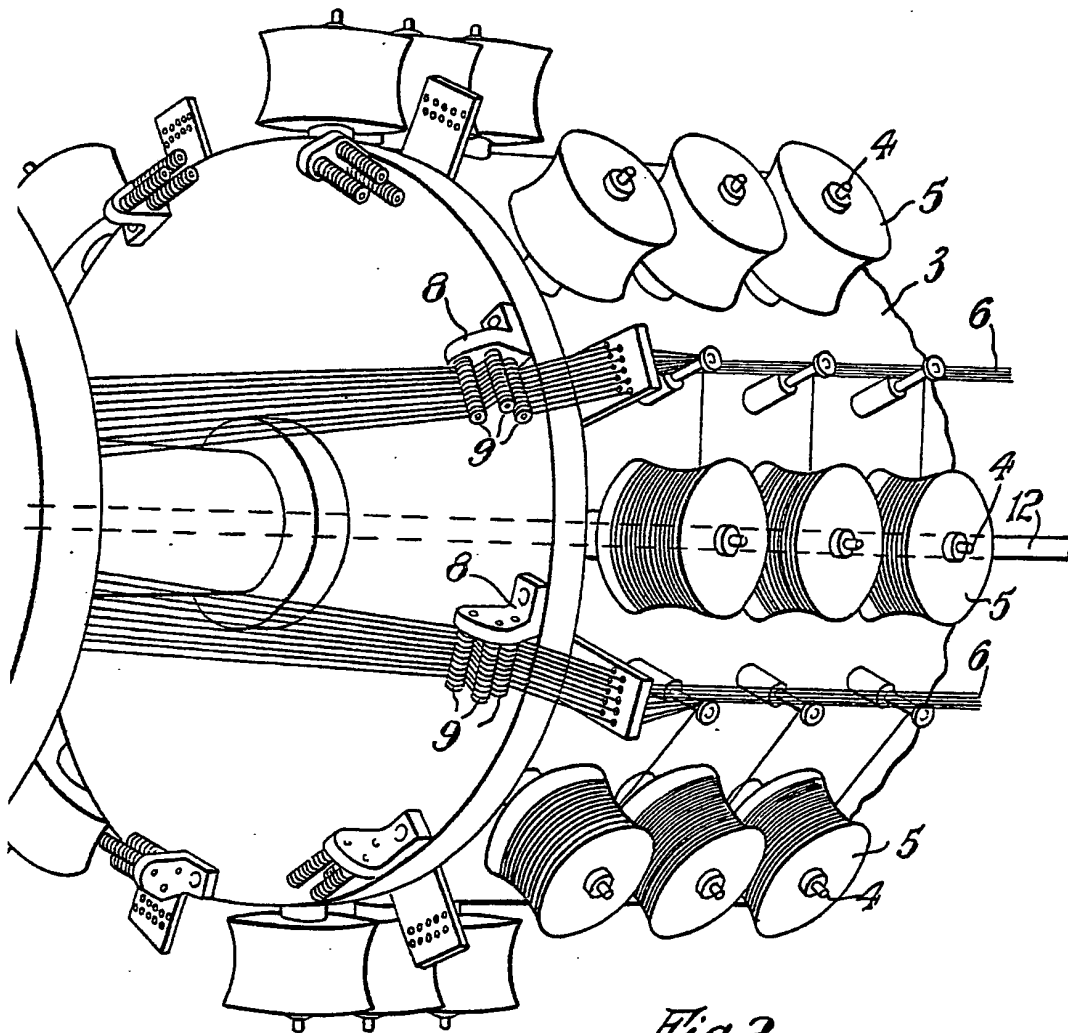
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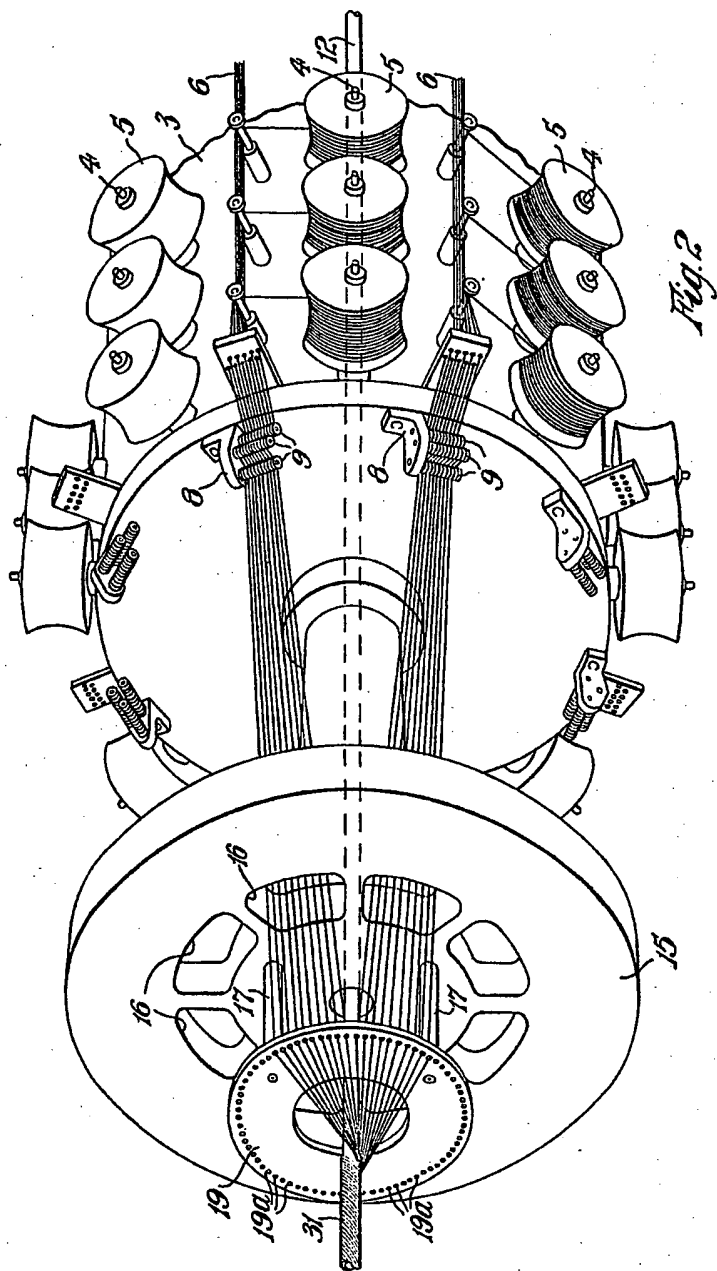
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Sheet 2



*Fig. 2*





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